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BRITISH ASSOCIATION, 1864.

ON A NEW METHOD OF EXTRACTING GOLD FROM AURIFEROUS ORES.

By DR. CRAKE CALVERT, F.R.S.

The following paper was read in the Chemical Section :

At the present time, when the auriferous ores of Great Britain are attracting public attention, it may be advantageous to persons interested in gold mining to be made acquainted with a new and simple method of extracting gold from such ores, which presents the advantages of not only dispensing with the costly use of mercury, but of also extracting the silver and copper as well as the gold which the ore may contain. Further, it may be stated that the process can be profitably adopted where the amount of gold is small, and the expense of mercury consequently too great. Without entering here into all the details of the numerous (about one hundred) experiments which I made some years since, before I finally arrived at the new method of extracting gold which I have now the honour of communicating to the meeting, allow me to state a few facts which are necessary to give a general view of the subject. If 2·2 parts of pure and finely-divided gold, obtained by the reduction of a salt of that metal, be added to 100 parts of pure sand, and placed in a bottle with a saturated solution of chlorine gas for twenty-four hours, only 0·5 of gold is dissolved. If the same experiment be repeated, but, instead of chlorine water, a mixture of chlorine water and hydrochloric acid be used, 0·6 of gold is dissolved. If, instead of employing hydrochloric acid and chlorine gas, a mixture of sand, reduced gold, and peroxide of manganese, with hydrochloric acid, are placed in a bottle, 1·4 of gold is dissolved; so that it would appear that, under the influence of nascent chlorine, the gold is more readily dissolved than when the same gas is mixed in solution with hydrochloric acid previously to being placed in contact with the auriferous sand. Still these processes leave a great deal to be desired in a commercial point of view, as more than a third of the gold remains undissolved; and the same results are obtained if the chlorine gas be generated by another method, viz., by adding to the auriferous sand a mixture of chloride of sodium, sulphuric acid, and peroxide of manganese. Being convinced, therefore, that nascent chlorine gas was a fit and proper agent for cheaply extracting gold from

ores, and that it was only necessary to modify the method of operation, I allowed the mixture of hydrochloric acid and peroxide of manganese, or of sulphuric acid, peroxide of manganese and chloride of sodium, to remain for twelve hours in contact with the auriferous sand; and then, instead of washing out the solution of gold, I added a small quantity of water, which removed a part of the acting agent, and this was made to percolate several times through the sand; by which method I succeeded in extracting from the sand, within a fraction, the whole of the gold. I then repeated the last experiments with natural auriferous quartz, and easily extracted the two ounces of gold per ton which it contained. I therefore propose the following plan for extracting the gold on a commercial scale :—The finely-reduced auriferous quartz should be intimately mixed with about 1 per cent. of peroxide of manganese; and if common salt be used, this material should be added at the same time as the manganese, in the proportion of three parts of salt to two of manganese. The whole should then be introduced into closed vats, having false bottoms, upon which is laid a quantity of small branches covered with straw, so as to prevent the reduced quartz from filling the holes in the false bottom. Muriatic acid should then be added if manganese alone is used, and diluted sulphuric acid if manganese and salt have been employed, and, after having left the whole in contact for twelve hours, water should be added so as to fill up the whole space between the false and true bottoms with fluid. This fluid should then be pumped up and allowed to percolate through the mass, and after this has been done several times the fluid should be run off into separate vats for extracting the gold and copper that it may contain. To effect this, old iron is placed in it to precipitate the copper; and after this has been removed, the liquor is heated to drive away the excess of free chlorine, and a concentrated solution of sulphate of protoxide of iron, or green copperas, is added, which, acting on the gold solution, precipitates the gold in a metallic form. By this method both gold and copper are obtained in a marketable condition. If silver is present in the ore, a slight modification in the process will enable the operator to obtain this metal also. It is simply necessary to generate the chlorine in the vitriol, manganese, and chloride of sodium process, taking care to use an excess of salt, that is, six parts instead of three, as above directed. The purpose of this chloride of sodium being to hold in solution any chloride of silver that may have been formed by the action of chlorine on the silver ore,

and to extract the metal, the following alteration in the mode of precipitation is necessary:—Blades of copper must be placed in the saline solutions, to throw down the silver in a metallic form, then blades of iron to throw down the copper, the gold being then extracted as previously directed. I think the advantages of this process are, 1st, cheapness; 2nd, absence of injury to the health of the persons employed; 3rd, that not only is the metallic gold in the ore extracted (as is done by mercury), but it attacks and dissolves all gold which may be present in a combined state, besides enabling the miner also to extract what silver and copper the ore may contain. I cannot, however, conclude without reminding you of what is generally underrated—that is, the heavy expenses which attend the bringing of the ore to the surface, its crushing and preparation, to render it in a proper state for being acted upon either by mercury or by any other agents.

MEASUREMENT OF GAS.

In the Mechanical Section Mr. Glover read a paper on the Measurement of Gas. The following is an abstract:—When about fifty years ago coal-gas was introduced, the want of a measure for its sale was at once felt. This was clearly indispensable in the event of its becoming a staple article of merchandise. To meet this want, Mr. Samuel Clegg invented the instrument which, from the circumstance of its measuring part being a drum revolving in water, has been denominated the wet gas-meter. Ingenious in principle, it has been found to have defects in practice. Its chief defect arises from the evaporation of the water, causing constant variation in the measuring capacity of the meter. This variation is acknowledged, even at the present day, to reach as high as from 20 to 30 per cent. There has been no lack of effort to remove this defect. Ingenuity, labour, and vast sums of money have been lavished upon it. Even could the level of the water be preserved at the same plane, the inclination of the meter would cause it to vary in measurement. And were the instrument so made that the sides of its measuring chambers should be at right angles to the plane of the water contained in it, this condition could only be preserved by making the bottom of the meter as perfect a plane as the water, and parallel with it, and the floor or shelf on which it is placed would require to be equally so, and to be maintained so. The measurement also varies according to the amount of pressure of the gas as it enters the meter, this pressure varying from 5-10ths of an inch water-pressure to six times that amount, according to circumstances. These causes of variation are constantly at work, and impart the instability of the water to the measure itself. It is attempted to retard the evaporation of the water by placing the meter in a cool situation; the consequence is, that some of the constituents of the gas are condensed; the water gets thick and tarry; the inner surface of the measuring chambers is coated with viscid substances; layer upon layer is deposited, and the size of the chambers diminished. Wherever the meter is placed the variation is only a question of degree. Should its situation be warm, the evaporation goes on rapidly. To preserve an uniform measurement, Mr. Clegg, shortly before his death, invented a method of floating the drum. The simplicity and theoretical beauty of this invention are apparent; and could the revolving drum be kept perfectly balanced and free from deposit, the water from impurity, the pressure of the gas from variation, it might be hoped that one serious practical objection to the wet meter had been removed. Sudden and unexpected extinction of the lights occur from the float falling in wet meters when there is too little water; and when there is too much, from the water passing over the lip of the spout and excluding the gas. From this cause lamentable disasters have occurred in public assemblies, as in churches and theatres. And surely it is a most unjustifiable addition to the dangers of railway travelling, to expose the

signal lights to such contingencies. The interest alike of the public and the gas companies required that the evil should be no longer evaded, but fairly met. The prevailing dissatisfaction, and the antagonism prejudicial to both which it necessarily created, at length drew the attention of the legislature to the subject. The mere fact that gas is not a liquid or solid, but an aërisome body, does not make it less desirable that a purchaser should obtain the quantity he pays for, or that the seller should be paid for the quantity he delivers. If security be given for the just measurement of gallons of oil and pounds of candles, it is equally required for cubic feet of gas. The Astronomer Royal's familiarity with the subject of the Standard Weights and Measures, specially qualifying him for such a duty, and his services to the Exchequer in connection with this subject having been acknowledged as of high value, their lordships applied to him to assist in providing the instruments and apparatus required by the Act. Acting under the authority of the Lords Commissioners, and with the assistance of Professor Miller, of Cambridge, the Astronomer Royal provided a bottle for measuring the cubic foot defined in Section 2. The idea of a legal standard of measure necessarily involves the highest attainable accuracy. Nothing short of this will satisfy either the Legislature or the public. Any amount of error which can be averted is a self-inflicted evil. The subject of weights and measures, even for solids and liquids, is confessedly one of great practical difficulty. The records of the Royal Society abundantly testify how much time, labour, and thought have been given to the solution of those apparently simple questions—What is a pound weight; what is a yard? But in constructing a legal standard measure for gas, the difficulties are necessarily much more complicated. An aërisome body has to be measured; invisible, highly elastic, varying in volume with every barometric change, very complex in its constitution, affected by every change of temperature, liable to condensation, and to be absorbed by water, of which it is also an absorbent. In constructing a standard measure, these various properties required to be taken into account, and the following conditions were considered essential: that the metal for making the bell should be such as would resist the chemical action of the constituents of coal gas and water, that this anti-corrosive substance should readily part with water, and be sufficiently hard to resist change of form, the application of any ordinary forces; that the bell should be a truly cylindrical vessel, having a correct seal engraved upon it, at once legible and durable, to indicate its capacity in cubic feet, and the decimal part of each foot; and that by strict attention to the mechanical adaptation of all the parts of the instrument, and the selection of materials and forms best adapted to their purpose, it should, as a whole, work easily, steadily, and correctly. The graduation of the holders involves nice scientific considerations, and a series of experiments requiring great delicacy and care. Although the cubic foot bottle was accurately adjusted for containing the legal standard or unit of measure, yet there was no method known by which it could be used directly in the graduation of gas-holders, or the division into multiples and decimals of a cubic foot. The instrument called a transferer was resorted to, consisting of an upper chamber containing exactly the volume of one cubic foot, and adapted with proper arrangements of cocks and pipes, by repeated discharges of the water, filling the upper chamber, into the lower chamber, to discharge in succession any number of volumes of air, each of one cubic foot, into any vessel properly prepared for their reception. With this instrument, trial upon trial was made, but with no satisfactory result. It was open to serious objections. The filling of the bottle produced agitation of the water, displacing air from the water, and entangling variable quantities of air in minute bubbles, many of which adhered to the inner surface of the bottle. Every means which suggested itself was tried to make it available, but these failing to give a uniform result, it was laid aside.

Analogous methods of transferring the exact cubic foot of air to the gas holders were resorted to, by which some of the objections to the transferer were obviated, and a closer approximation made to uniformity of result. Still this uniformity was not such as to justify their adoption in the division of the scale. Eventually a plan was adopted which was found free from the same liability to error. Instead of using the cubic foot bottle indirectly through the intervention of a second vessel, as had hitherto been done, the second vessel was dispensed with, and the bottle was used directly. Close the opening caused by the withdrawal of the plug with glass; solder a piece of leaden tube to the end of the tap; connect this tube with the gas-holder to be tested; place a cistern below the bottle which has been secured in a fixed position; raise the cistern steadily, without agitation of the water, through the entire length of the bottle until the water reaches the point where the plug of the tap, had it been retained, would have stopped it, the entire volume of air, viz., one cubic foot defined by the contents of the bottle will be found to have been transferred to the gas-holder. Tested by numerous experiments, the results of this method have been invariably satisfactory, and it has removed a difficulty long felt by meter makers in the graduation of their holders for testing meters. To reduce to practice the idea of a machine for the accurate measurement and correct registration of gas, the experience of half a century has shown to be no easy problem. The construction of a good and durable dry gas meter involves a multiplicity of mechanical and chemical considerations, to each of which its due weight must be assigned. A subtle, invisible, elastic, and complex fluid, susceptible of change in condition and volume from very slight variations of temperature and pressure, has to be accurately measured, and the result must be correctly recorded. The instrument is self-acting. It must do its work in a closed chamber, continuously or at intervals, and free from all interference. The parts of the instrument which come in contact with gas must be made of anti-corrosive material, and the material forms and combinations of its different parts must be so accurately adapted as to produce steadiness, uniformity, and correctness in its movements. Whilst gas, having become a staple commodity, one of the necessities of life, that it may have a real practical value the instrument for its measurement must be produced at a price which will place it within the reach of every class. Realizing these essential conditions, and approaching as near as may be to the accuracy of the standards, the dry gas meter has taken the place to which it is entitled, as a valuable addition to many ingenious and useful contrivances of mechanical science.

COPPER SMELTING.

Mr. Spence read a paper on Copper Smelting and the means of economising the sulphur evolved in the operation. He said he had for some years directed his attention to this subject, and his aim had been to erect works on sound chemical principles. The first furnace he erected was successful in calcining the small ores with a small expenditure of fuel and labour, with elimination of all the sulphur from the ores if that was required, and it enabled him to send all the sulphur so eliminated into the vitriol chambers as sulphurous acid gas. Very soon afterwards he erected additional furnaces, and all the sulphuric acid made at his works since the end of 1861 had been made from these small ores by similar furnaces. The amount of sulphur wasted in copper smelting, and which could be economised for the use of such calcining furnaces as he had erected, was something enormous. It had been estimated at £70,000 tons per annum, which at the present time would be worth £455,000.

LIGHTING GAS BY ELECTRICITY.

Professor W. B. Rogers exhibited an invention by Mr. Cornelius, of Philadelphia, for lighting gas by electricity. It was the first time it had been exhibited in Europe. The electrical apparatus was attached to a common gas-

burner. It was an application of the principle of frictional electricity (the apparatus being a modified form of electrophorus), and as soon as the Professor removed a stopper of vulcanite, the friction generated an electric charge, and the gas was instantly ignited. It could be arranged so as at the same instant to light the whole of the burners in a room. It was the invention of a man of little education, who had turned his self-gained scientific knowledge to a practical application.

Proceedings of Institutions.

GLASGOW MECHANICS' INSTITUTION.—On the evening of Friday, 30th September, a meeting of the directors of this Institution was held in the hall, for the purpose of distributing the certificates awarded by the Society of Arts at the last examination. The chair was occupied by Professor Anderson, of the Glasgow University, who took occasion to explain the mode in which the examinations are conducted, for which the certificates and prizes are given. He was glad to say this Institution holds a very creditable place, and had held a very creditable place among such institutions all over the country. It was his pleasing duty now to distribute certificates to the number of 47, and in addition to that three of the Society's prizes had been awarded to students of the Glasgow Mechanics' Institute—the 3rd prize in English Literature, the 3rd in Animal Physiology, and the 2nd in Bookkeeping. Professor Anderson then proceeded to the distribution of the certificates, after which he said that this was now the fourth time in which he had the honour of presiding on such occasions. The certificates which he had just distributed, 47 in number, had been divided into three different sets—7 first, 19 second, and 21 third-class certificates. The number was larger than last year, but smaller than in the first year. The chief difference lay in this, that the number of first-class certificates was not so large as on any previous occasion. In the first year's competition the number of first-class certificates had been larger, in proportion to the number of candidates, than in any other Institution in the country. He thought that, at all events, the position of the Glasgow Institute was respectable, and he trusted that those intending to present themselves at these examinations would aim at the higher class certificates, so that the Institute may in future years more than maintain the position which it has gained. The Institute was only one of four in Glasgow which sent up candidates to the Society of Arts, and it has at all times carried off its just share of certificates, and more than its just share of prizes. Professor Anderson explained that a high standing at the examinations was not merely a pleasing success on the part of the young men who gained it, but that it opened the way to more substantial rewards, as Government situations of considerable value and importance were thrown open to the successful candidates. Two young men had gone from this Institution to Government offices, because of the high standing they had acquired at the examinations, and one young man, partly trained at the Mechanics' Institute and partly at the Athenaeum, and who had had the good fortune to carry off the highest honour at the disposal of the Society of Arts (the Prince Consort's Prize), was, he believed, offered a Government appointment, which, however, he refused. Many of the branches of study pursued at the Institute were, he remarked, of special service in the business of life, and he was very glad to find that there were others coming under the head rather of the ornamental than the useful. He was rejoiced to find that here the two branches were combined. We must have something to fall back upon in after years—some pursuit the indulgence in which will lighten our daily toils—such as music and drawing. The tendency in these countries had been rather to deprecate such studies, and to imagine that whilst the useful must be attended to, the ornamental may with safety be

disregarded. He believed that people had now found out their mistake on this point, and was glad to find that in the Institute there was such a happy combination of the two elements.—Mr. R. B. Smith proposed a vote of thanks to the Local Board, coupled with the name of Professor Anderson, for their generous performance of the task of conducting these examinations.—Professor Anderson, in the name of the Local Board, begged to return thanks for the manner in which the motion had been made, and in doing so remarked that the duties of the Board were not of a very laborious character, but involved rather more care and discrimination than labour. The principal labour they had was the setting of papers for the preliminary examination.—Bailie Couper moved a vote of thanks to the chairman, which was carried.

NAILSWORTH LITERARY AND MECHANICS' INSTITUTE.—On Tuesday, September 6th, the annual general meeting was held. The chair was taken by the president, M. H. Whish, Esq. The eleventh annual report states that the number of members has considerably increased; the financial condition of the society has improved; the attendance at lectures has been good, and the penny readings have been very successful. The number of members at the close of last session was 176; the number now on the society's list is 223, showing an increase of 47. The only point left to be desired on this head is that there was a larger proportion of members at the ten shilling subscription. The balance due to the treasurer has been considerably reduced during the past year, and this in spite of the unavoidable incurrence of several extra expenses, amounting to £12, four pounds of which have been spent in fitting up the coffee room, and the result has been a great acquisition to the society. The report shows that the receipts for the year have been £181 4s. 5d., the expenses £162 10s. 9d., leaving a balance on the year's account of £18 13s. 8d. in favour of the society, and reducing the old balance from £32 15s. 0½d. to £14 1s. 4½d. The committee believe that there is every prospect of completely clearing the Institute from debt during the coming year, and recommend that £5 be voted for the improvement of the library. The attendance at the society's lectures during the past session has been highly satisfactory. Besides the opening entertainment, there were nine public lectures, five of which were given gratuitously. The penny readings have been eminently successful. The audiences were large, and appeared to be greatly interested in the pieces that were read. The committee believe that the penny readings may be rendered still more interesting by a little more attention to arrangement; and recommend that a sub-committee be formed, whose especial province it shall be to engage amateur readers and musical performers for these entertainments, and also to draw up a few rules for the better regulation of the readings, as to time, and in any other respects that may seem desirable. The coffee room has been much frequented. The games of chess, draughts, and bagatelle have been extremely popular. An excursion took place to Ozleworth-park, the seat of J. Rolt, Esq., Q.C., M.P., whose kindness in throwing open his grounds to the members of the Institute, at a few hours' notice, and under circumstances of great emergency, was gratefully appreciated.

ULVERSTON LECTURE AND SCIENTIFIC ASSOCIATION.—In presenting their fifth report, the committee show that they have endeavoured as usual to provide the members with lectures of a high class. The session opened with a lecture by the Rev. Hugh Stowell Brown, on "Common Sense;" then followed George Dawson, Esq., who gave a lecture on "Ill-used Men;" then came Dr. Spencer T. Hall, with a lecture on the "Origin, History, and Destiny of a Drop of Blood." Professor Grembank as usual gave a night of Readings from Shakspeare and others. James Glaisher, Esq., gave an interesting lecture on Balloons. These were the whole of the paid lectures, some of which were not successful in a pecuniary point of view, but intellectually they were so. In addition

to these the society is much indebted to several gentlemen who lectured gratuitously. A lecture on "Intellectual Improvement," by Dr. Barber; "The Struggle and the Victory," by John Johnson, Esq., of Liverpool; "Macbeth," by Mr. Wm. Salmon; "Wants: Real and Imaginary," by the Rev. M. Moseley; "A Visit to Antwerp," by Dr. H. Barber; "Natural History" illustrated by the magic lantern, by H. Field, Esq.; "Lord Bacon," by Mr. R. Pearson; a series of Readings by Messrs. J. P. Morris, R. Pearson, and D. C. Moss; "Geology, and its Practical Results," by the Rev. W. Till; "Taxation as it is, and as it ought to be," by John Noble, Esq., of Liverpool; "Cardinal Wolsey," by Mr. D. C. Moss; "Peace and War," by John Johnson, Esq. a second series of Readings by Messrs. W. Salmon, R. Pearson, J. P. Morris, and J. Cockerton; "Men who have risen from the Working Classes," by Mr. J. Geldart; "The First Traces of Man in Britain," by Mr. J. P. Morris. This last lecture brought the session to a close. This session there is a slight decrease in the number of members, the list at present standing thus:—Honorary members, 5; ordinary, including 12 ladies, 105; apprentices, 12; total, 122. A discussion class was formed for the mutual benefit of the members, but from some unexplained cause it gradually dwindled into oblivion. The committee think this a matter of regret, seeing that the formation of classes for mutual improvement might be the means of keeping the association more alive. The formation of a naturalists' class has often been discussed.

THE APPLICATIONS OF ELECTRICITY.

A grand prize of 50,000 francs, offered by the Emperor of the French, has been awarded to M. Ruhmkorff, and has given rise to a very remarkable report upon the subject in general.

The prize was originally offered in 1852, and its award entrusted to a commission composed of the following gentlemen:—M. Dumas, senator, President; Messrs. Pelouze, Regnault, Rayer, Serres, Becquerel; Baron C. Dupin, Baron Ségnier, General Morin, General Probert, and H. Sainte-Claire Deville, all members of the Institut; M. Reynaud, inspector-general of roads and bridges, and chief of the lighthouse service, and M. Jamin, Professor of Physics of the Faculty of Sciences in Paris.

In 1858, the commission proceeded to the award, and came to the decision that there was no application of sufficient importance to warrant the disposal of such a prize, but petitioned the Emperor to allow the offer to stand good for the next period of five years. The present report announces a notable improvement in the application of electrical power, and awards the grand prize to M. Ruhmkorff. M. Froment has been raised to the grade of officer of the Legion of Honour, at the suggestion of the commission.

In the third place the commission recommend the repetition of the offer of the prize of 50,000 francs, and this recommendation has been acceded to by the Emperor. The report of the commission is from the pen of its President, M. Dumas.

M. Ruhmkorff, it appears, was formerly a workman in the employ of some of the best instrument makers in France, became afterwards a manufacturer on his own account, and finally head of one of the first establishments in Europe. He is essentially a self-educated and self-made man, and, in the words of the report, "worthy to serve as a model to the many intelligent workmen engaged in the manufacture of instruments of precision."

After referring to the discoveries of Ampère, Oerstedt, and Faraday, the report goes on to say:—Every time that the electricity of the pile comes into contact with a conducting wire and produces a current therein; every time that the communication and the current are interrupted, the phenomena which are produced are not confined to such transmission or interruption of the current. The bodies in the neighbourhood of the con-

ductor are influenced. If the wire which receives the current is wound round a bobbin, and this in its turn is enveloped in another bobbin of uncharged wire, each time that a direct current is created or interrupted in the former, a current is produced in the latter in the contrary direction. In multiplying these interruptions or in rendering them more frequent, the inductive coil becomes an electrical apparatus of a special and novel kind, and presents phenomena which resemble those of the plate machine. From the year 1851 M. Ruhmkorff has devoted himself to the construction and perfecting of such apparatus; and he has succeeded in giving his name to it, in raising it to importance in a scientific point of view, and in endowing it with an amount of energy which fits it for the basis of serious applications. The apparatus of Ruhmkorff, then, combines the two forms of electricity which were separated by a long interval, that of the frictional machine and of the pile. The effects of the Ruhmkorff apparatus are well known; it can be charged almost instantaneously; its spark inflames combustible substances, melts metals and the most refractory minerals, and reproduces all the effects of lightning, and pierces without difficulty masses of glass four inches in thickness.

Electricity can now be employed to illuminate glass tubes in such a manner as to be highly useful in mines, or other places where there is danger of explosion; under water, for divers; and in surgery, for throwing light into the mouth or other parts, without producing any sensation of heat. The Ruhmkorff apparatus has been found particularly useful for marking the instant of the departure of projectiles and that of their striking any object, and thereby measuring their velocities. Five hundred have been constructed expressly to inflame the gas used in the machines Lenoir; and it is in everyday use in quarries, tunnels, and other situations for the firing of trains of powder, for which its regularity of action, its great power, and the distance through which it operates, render it peculiarly adapted. The few elements which it requires, stated at three in lieu of a hundred, and its capacity for firing eight or ten trains or mines at the same instant, are also great additional advantages. In 1858 it was employed with great success by Lieutenant Trève, of the French navy, in the removal of the bars formed in the lagunes of Venice; and in 1860 it was with it that the principal fort of the Peiho, in China, was blown up by the firing of eight mines simultaneously, and that the strong iron stockades were cleared from the bed of the river.

The report dwells at considerable length on the application of electricity in the mechanical arts, for purposes of illumination in electro-metallurgy and in surgery.

With respect to the first of these divisions, the report says, that notwithstanding the great improvements that have been made, the "electric-horse" costs at present twenty or thirty times more than the "steam-horse," and that, "as a motor for works requiring power, electricity is therefore yet far from supplying a substitute for steam." But there are many cases in which it is serviceable, such, for instance, as in the machine Lenoir, in which the sudden ignition of gas causes an instantaneous elevation of temperature, first on one side of a piston in a cylinder and then on the other, and thus creating a motor; or for producing, at a given moment, and at a distance, the movement of light mechanical appliances which direct the action of other parts moved by powerful mechanical means, acting in this latter case after the manner of the nervous system in animals, which transmits the orders, and leave to the muscles the task of carrying them into effect. In this way it has been used to throw into action the brakes of railway carriages, causing the impetus of the wheels themselves to retard their own progress; and, acting on the same principle, experiments have been made with the view of making steam boilers feed themselves spontaneously.

Reference is made also to the engraving of rollers by

means of a design drawn with non-conducting ink on metallic paper; to the copying of a design from one roller on another, as in the machine of M. Gaiffe; and to the pantographic apparatus of M. Cazelli, which is described as capable of transmitting from one end of France to the other despatches in any language whatever, tracing drawings, or whatever is delineated on a sheet of metallic paper prepared for the purpose, and reproduced on another paper rendered chemically impressionable to the electric current; to the weaving machinery of M. Bonelli, which, although not found to succeed in complicated work, will, it is expected, be eventually applied usefully in other cases.

"But," says the report, "it is in those cases in which the mechanician desires to transmit a feeble force to a great distance, as it were, with intelligence and exactitude, that electricity stands at present without a rival," and it is thus that it is so eminently adapted to telegraphic purposes. M. Dumas dwells very emphatically on the system of Mr. Hughes, the American, which is explained at length; and, looking at the inconceivable rapidity of transmission which is obtained by it, the learned reporter believes that if to the combinations of Mr. Hughes were added the celerity of finger of a pianoforte player, there seems no reason why a reporter should not be able to transmit a speech to Strasbourg, Marseilles, and Bordeaux, while it is being spoken in Paris.

The commission, however, properly points out that the practical application of the wonderful powers of electricity depends greatly on mechanical exactitude, and says that the combinations of Bonelli, Cazelli, and Hughes remained in the condition of mere experiments until M. Froment, a manufacturer of instruments of precision in Paris, undertook their construction.

As regards illumination by electricity, the report commences with a reference to the extraordinary combinations and experiments of Sir Humphrey Davy (after whom it may be mentioned, *en passant*, a street has just been named in Paris), with a pile of 2,000 elements, having a superficial area of more than a hundred square yards, and which M. Dumas himself repeated thirty years since in his public lectures, and then refers to the Bunsen pile, which contained but thirty elements, and to the many unsuccessful experiments made to light towns by electricity, an attempt designated as a mistake, on account of the fact that the value of electric illumination is in great single lights, which are unsuitable to purposes where dissemination is required. Reference is made to the application of the hard residue of the gas retort in place of charcoal; to the production, by M. Jaquelin, of the Paris School of Mines, of an artificial substance cheaper and purer than the former; to the arrangement of M. Léon Foucault, by means of which the light itself regulates its conductors; to Mr. Staite's invention for the same purpose; to M. Serrin's self-lighting regulator; and lastly to the new apparatus invented by M. Foucault, which M. Dumas considers the best yet produced.

The report then arrives at the application of dynamic electricity to the same purpose, and details the results that have been arrived at by means of the scientific apparatus of Pixti, as applied, in Belgium, by Nollet to practical purposes. A Parisian company, the "Alliance," has applied a modification of this apparatus with perfect success in the slate quarries of Angers, in the workshops of the railway of the north of Spain, and many other places. The most important application, however, of the kind has been made at Havre, an electric light having been placed on Cape La Hève, near a light-house of the old kind of the first order. A comparison of the two gives the following results:—The light of the latter is equal to 600, and that of the former to 3,000 carcel lamps, the cost of the oil-light being equal to seven centimes for each unit, while that of the electric light is rather less than two centimes, the expenses of the light-house and the interest on the capital engaged all included.

The report gives special praise to M. Oudry for his

galvano-plastic work on cast and wrought iron, noticed at length in the *Journal** some time since, and the Emperor has rewarded M. Oudry with the Cross of the Legion of Honour.

With respect to medical electricity, the report alludes to the success which Dr. Duchenne, of Boulogne, has met with in the treatment of chronic affections of the nerves and muscles, and to one hundred and forty cases, reported by M. Middeldorf and other surgeons, of the successful treatment of polypi and tumours, by means of platinum wires heated by electricity. (In connection with this important subject the reader is referred to a late notice in the *Journal†* of experiments made by Dr. Nelaton.)

In the conclusions of the report, M. Dumas says, as the chemist declares that there is neither creation nor loss of matter, so the philosopher maintains that there is neither creation nor loss of power; heat, light, magnetism, and electricity are but manifestations of various conditions of an ether in movement, and are transformed one into the other with the utmost facility. Of these forces, electricity has been the most recently studied, and its properties are still the most mysterious, in spite of the grand discoveries which have been made. It may be said, in fact, from the observations made since the commencement of the century, that of all the manifestations of the movements of the ether, those which give rise to electrical phenomena are at once the most delicate and the most fruitful.

REPORT OF THE COMMISSIONERS OF PATENTS FOR 1863.

It appears from this document that the number of applications for provisional protection recorded within the year 1863 was 3,309; the number of patents passed thereon was 2,094; the number of specifications filed in pursuance thereof was 2,068; the number of applications lapsed or forfeited, the applicants having neglected to proceed for their patents within the six months of provisional protection, was 1,215.

The Act 16 Vict. c. 5 enacts that all letters patent for inventions, to be granted under the provisions of the Patent Law Amendment Act, 1852, shall be made subject to the condition that the same shall be void at the expiration of three years and seven years respectively from the date thereof, unless there be paid, before the expiration of the said three years and seven years respectively, the stamp duties in the schedule thereto annexed, viz., £50 at the expiration of the third year, and £100 at the expiration of the seventh year. The patent is granted for fourteen years.

Four thousand patents bear date between the 1st October, 1852, and the 17th June, 1854 (being the first 4,000 passed under the provisions of the Patent Law Amendment Act, 1852). The additional progressive stamp duty of £50 was paid, at the end of the third year, on 1,186 of that number, and 2,814 became void. The additional progressive stamp duty of £100 was paid at the end of the seventh year on 690 of the 1,183 patents remaining in force at the end of the third year, and 796 became void. Consequently nearly 70 per cent. of the 4,000 patents became void at the end of the third year, and nearly 90 per cent. became void at the end of the seventh year. The proportionate number of patents becoming void, by reason of non-payment, continues nearly the same to the present time.

All the provisional, complete, and final specifications, filed in the office upon the patents granted under the Act since 1852, have been printed and published in continuation, with lithographic outline copies of the drawings accompanying the same, according to the provisions of the

Act 16 and 17 Vict. c. 115. The provisional specifications filed in the office and lapsed and forfeited, have also been printed and published in continuation. Printed certified copies of the specifications filed in the office, as also certified copies of patents, and of the Record Book of Assignments of Patents and Licenses, with copies of such assignments and licenses, have been sent, in continuation, to the Office of the Director of Chancery in Edinburgh, and the Enrolment Office of the Court of Chancery in Dublin, pursuant to the Act of 1852 and the Act of 16 and 17 Vict. c. 115.

The work of printing the specifications of patents under the old law, 13,561 in number, and dating from 1711 to 1852, was completed in 1858, and copies thereof are sold in the office, at the cost of printing and paper. Abstracts or abridgments of specifications, in classes, and chronologically arranged, of all specifications of patents, from the earliest enrolled to the present time, are in course of preparation and publication.

The classes already published and on sale at the office, at prices covering the cost of printing and paper, are.—
 1. Drain tiles and pipes; 2. Sewing and embroidery; 3. Manure; 4. Preservation of food; 5. Marine propulsion; 6. Manufacture of iron and steel; 7. Aids to locomotion; 8. Steam culture; 9. Watches, clocks, and other time-keepers; 10. Fire-arms and other weapons, ammunition, and accoutrements; 11. Paper (Part I. Manufacture of paper, pasteboard, and papier maché); 12. Paper (Part II. Cutting, folding, and ornamenting, including envelopes, cards, paper hangings, &c.); 13. Typographic, lithographic, and plate printing; 14. Bleaching, dyeing, and printing fabrics and yarns; 15. Electricity and magnetism, their generation and applications; 16. Manufacture and applications of india-rubber, gutta percha, &c., including air, fire, and water-proofing; 17. Production and application of gas; 18. Metals and alloys; 19. Photography; 20. Weaving; 21. Shipbuilding, repairing, sheathing, launching, &c.; 22. Bricks and tiles; 23. Plating or coating metals with metals; 24. Pottery; and 25. Medicine, surgery, and dentistry.

The following are in course of preparation:—Preparation and combustion of fuel; Steam engines; Spinning; Railway signals and communicating apparatus; Music and musical instruments; Railways; Hydraulics; Oils, animal, vegetable, and mineral; Lace; Ventilation; Agricultural implements.

SCHEDULE.

AN ACCOUNT OF STAMP DUTIES, received under the Act to substitute Stamp Duties for Fees (16 Vict. c. 5), for the year.

	£	s.	d.
3,309 petitions for grant of Letters Patent, at £5 each...	16,545	0	0
2,301 notices of intention to proceed with application, at £5 each ...	11,505	0	0
30 notices of objection to the grant of Letters Patent, at £2 each ...	60	0	0
6 notices of objection to the sealing of Letters Patent, at £2 each ...	12	0	0
2,059 warrants for Patents, at £5 each ...	10,475	0	0
2,094 Patents sealed, at £5 each ...	10,470	0	0
2,011 Final Specifications filed, at £5 each ...	10,055	0	0
57 complete Specifications filed, at £5 each ...	285	0	0
526 entries of assignments of Patents and licences, at 5s. each ...	131	10	0
780 searches and inspections, at 1s. each ...	39	0	0
12,866 folios of office copies of documents, at 2d. per folio ...	107	4	4
586 Patents upon which the progressive stamp duty of £50 has been paid...	29,300	0	0
212 Patents upon which the progressive stamp duty of £100 has been paid	21,200	0	0
8 duplicate Patents issued in lieu of original Patents lost or destroyed, £5 each ...	40	0	0
8 petitions on application for disclaimers, £5 each ...	40	0	0
7 caveats against disclaimers, at 2d each ...	14	0	0
7 new Patents granted upon Her Majesty's Order in Council under the 40th section of the Act (1852), being a prolongation of a Patent granted previous to the Act, at...	35	0	0
	£110,313	14	4

* Vol. xii., p. 205.

† Vol. xii., p. 674.

BALANCE SHEET OF INCOME AND EXPENDITURE FOR THE
YEAR 1863.

RECEIPTS.	£ s. d.
Stamp duties in lieu of fees	110,313 14 4
By Stamp duties on the sale of prints of Specifications, &c.	1,885 4 6
	<hr/>
	£112,198 18 10
PAYMENTS.	£ s. d.
Fees to the law officers of England	9,076 4 0
Their clerks	825 10 0
Salaries of the officers and clerks in the Patent Office	6,874 0 0
Compensations	4,584 0 0
Current and incidental expenses in the Patent Office	4,577 2 1
Cost of stationery supplied by Her Majesty's Stationery Office, books for the free library, and binding, &c.	866 5 7
Rent of offices, rates, and taxes	617 0 0
Messrs. Eyr and Spottiswoode for printing Specifications of Patents, indexes, &c., and lithographer's bills for drawings accompanying Specifications	15,673 5 2
Cost of paper supplied to the printer and lithographer by Her Majesty's Stationery Office	2,504 3 0
Cost of coals and other fuel supplied to the Patent Office by Her Majesty's Office of Works, and furniture and repairs	649 9 9
Expenses incurred in respect of the Museum at South Kensington	678 15 6
Salaries of officers and clerks for ditto	730 0 0
*Revenue Stamp duty account as below	20,575 0 0
Surplus Income for the year 1863	43,968 3 9
	<hr/>
	£112,198 18 10

LABOURERS' COTTAGES.

The following is from the *Daily News* :—

Our agricultural labourers will soon be better housed. Every speaker at the rural festivals of this autumn, from the Harvest Home to the District Agricultural Association Meeting, has plenty of difficulties to enumerate and describe; so that if we were to read all such speeches, and look no further, we should wonder that a subject so hopeless, a thing so impracticable, should be discussed at all. Yet it is discussed everywhere and on all occasions; and this of itself is ground enough for a strong assurance that whatever is desirable in the case will be done. When it is once agreed, from end to end of England, that any condition of social life is in need of amendment—that it is "extremely serious"—that it is "very urgent"—the matter is sure to be taken in hand before long. If the difficulty lies merely in settling whose business it is to make the reform, or how the change can possibly be afforded, we may be satisfied that the needful thing will soon be done. We are never very long, in our day, in finding out that great mischiefs do not answer, and that it must pay somebody—probably everybody—to change those mischiefs into benefits. Therefore we believe that (the mischiefs of bad cottages being generally agreed upon), our rural labourers are likely to have better dwellings from this time forward than they have ever had before.

And how is this to come to pass? It may be useful, in view of this question, to bring together and compare

* The Act of 1852, in lieu of the old duties upon Patents, imposed a Revenue Stamp duty of £5 upon the warrant of the law officer, £10 upon the certificate of payment of the progressive fee of £40 at the expiration of the third year, and £20 upon the certificate of payment of the fee of £80 at the expiration of the seventh year of the Patent.

The Act of 1853 (16 Vic. c. 5) converted all the fees imposed by the Act of 1852 into stamp duties.

The Revenue Stamp duty account for the year 1863 is as follows:—
2,095 warrants of the law officers for Patents,

at £5 each	10,475 0 0
588 Patents on which the progressive duty of £50 has been paid at the end of the third year from their respective dates (£10 being Revenue Stamp duty and £40 fee stamp duty), 588 at £10 each	5,860 0 0
212 Patents on which the progressive duty of £100 has been paid at the end of the seventh year from their respective dates (£20 being Revenue Stamp duty and £80 fee stamp duty), 212 at £20 each...	4,240 0 0
		<hr/>
		£20,575 0 0

a few of the sayings of leading country gentlemen who have lately been speaking on the subject.

In one and the same newspaper we find the following. Crowded and stinking cottages are an intolerable evil. This appears in every speech, and is nowhere disputed. As we go on, we learn that landowners cannot be expected to supply good cottages on unremunerative terms:—that labourers cannot, out of agricultural wages, pay a remunerative rent:—that landowners cannot let improved cottages to labourers at a practicable rent, because the tenant farmers regard such an act as an unfair competition for labour:—that it is due to the tenant farmer that his labourers should live near their work:—that it is good for the labourer that he should live near his work, to save a great waste of his strength and time:—that the labourer is a man and a member of society, and likely to prefer living at a distance from his work, on account of the sociability of the town or the village, and that he has a perfect right to please himself in the matter:—that no decent cottage can be built for less than £100; that six per cent. is considered a very fair return for the outlay; and that this is more than rural labourers can pay:—that when cottages are properly ventilated, drained, &c., the tenants are not enlightened enough to value the benefit, but stop up the air-channels with old petticoats, showing that such improvements must wait till the poor people are wiser:—that there is a great danger impending—the danger that labourers earning 10s. a-week will be invited to the factory districts to earn twice or thrice as much:—that there is no fear that rural labourers will ever leave their homes, their landlords, and their employers, on any inducement whatever:—that it is unpatriotic and cruel to encourage country people to emigrate, far from their natural protectors, and the gentry and the farmers who were their early friends. There is much more, but this will do. Here we see the rural labourer in a remarkable position. His earliest friends and best protectors are the landowners and farmers in his neighbourhood; yet from them—his employers—he receives wages which will not afford the rent of a decent house, and the landlord must not give him better accommodation for the money, because the tenant farmers will not allow it; and the tenant farmers are not to require the cottager to live near his work, because he must please himself about living in society or in a retired situation. But we need not show up the inconsistencies and absurdities of the statements hazarded. We need only ask whether the labourer is not hardly used if he may neither have a wholesome house for the rent he can pay, nor wages which will pay for a wholesome house, nor freedom to accept an invitation to earn better wages. Turn the case which way we will the labourer is the afflicted party. This will not do, and it cannot go on. Since the Society for the Improvement of the Dwellings of the Labouring Classes, last May, passed seven resolutions on how the thing might in part be done, it has been clear that the rural class will not be left to be bandied about between the landlords, the farmers, and the parish officers. We are shown what the Legislature can do, and therein we are shown what the Legislature cannot do, and somebody else must therefore undertake.

If it is true, as we believe, that the improvement must be sanctioned by commercial principles, it follows that the wages of rural labour must be determined by the same principles—whether the pay is to be all in money or partly in house-room. As for the cost of good cottages, it varies largely in different parts of the country. Lord Lyveden said at Wellingborough last week, that nothing short of £100 will build a good cottage; and this is true in many places, while in certain districts, where the materials are present and the conditions favourable, a thoroughly wholesome and comfortable dwelling of four rooms and extras can be supplied for £60. However this may be, on any spot, the dwellings must yield the interest of the capital and the cost of repairs. None but the low speculators of whom we hear so much would desire a

larger return than this. Where is it to come from? No doubt from the income of the inhabitants. If the dwellings were in existence they would be eagerly applied for as soon as the neighbourhood had seen how well it answers to pay a somewhat larger rent, to escape sickness, inability to work, doctors' bills, and the endless waste of food, clothes, and furniture which takes place where damp and dirt are present. If, after all, the wages are not enough to pay a rent of from £4 to £7, the wages will rise. All indications point to such a rise of wages. The labourers themselves are rising in intelligence and character as the art of tillage advances. Where agricultural machinery is employed, the men are like a different race from their fathers; and the economy of time and force by the use of machinery at once improves the pay of the men, women, and the boys employed. In such districts there are always people who perceive that it answers to build new cottages, or to put such as exist into good condition.

If arbitrary impediments are in the way, they must be removed; and if certain facilities are needed, they must be supplied. The remainder of the law of settlement, universally condemned as it is, will have to be repealed; and the Act by which Irish gentry have been, since 1860, enabled to borrow money to build cottages may be extended to England, according to the second of the seven resolutions referred to above. In a rising district, where agriculture advances, and wages with it, professional builders will erect dwellings, if the landowners and farmers, and the labourers themselves, are not beforehand with them. It is not an enterprise which need go a-begging, when its bearings and prospects are once understood.

Yes, even the labourers themselves. The co-operators are obtaining a footing in the agricultural districts, and both farming and cottage improving flourish in their hands; and there are building societies, good as well as bad, which exhibit the tempting example of labourers living in homes of their own. In all directions, perhaps, the prospect is more hopeful than in districts where gentlemen at the after-dinner table rise to tell the prize-taking labourers at the bottom of the room, as Lord Lyveden did recently, that it is a shocking thing that their family dwellings are so bad, but that neither the landlord can be required, nor the farmer expected, nor the labourer enabled, to mend the case. If there is any thing elsewhere so dreary as this it is where, as in Buckinghamshire the other day, the rural labourers were informed that it was a shocking thing to go where they would earn more, while no promise of prosperity was offered as an inducement to stay. One of the most comfortable things said was at that meeting, when Mr. Hubbard, M.P., related that two of his farming tenants had offered him five per cent. on any outlay he would make in improving the dwellings of their labourers. He agreed; and here was a sound practical beginning. When such a step is taken, others follow; and before long there will be no further hearing for croaking philanthropists who stand up to preach that some things of vital consequence must be done, but that there are no possible means of doing them.

Fine Arts.

DISCOVERY OF ANTIQUITIES AT ROME.—A man sinking a shaft for a well close to the Campo dei Fiori, came upon some stone slabs at a depth of 30 yards, placed at an angle, and bearing the letters F. S. C. These slabs were found to cover a colossal bronze statue, 18 feet in height, of Hercules, perfect except the feet, which are wanting, and the occiput, the whole strongly gilt. The club, too, on which the statue leaned when in an upright position, is wanting, but the left hand bears the apples of the Garden of the Hesperides. Its value is estimated at upwards of

£4,000, and as the line of stone slabs continues, it is thought not improbable that another statue may be concealed there. It is conjectured that this valuable relic was purposely overthrown and buried previous to some barbarian incursion, and arched over for safety, by the inscription F. S. C., *factum Senatu consulto* (done by decree of the Senate). The feet were probably broken off in overthrowing it, but there is no trace of the pedestal. The back of the head, as the statue lay on its back, has probably been lost by corrosion. The discovery seems to point at the existence of a temple of Hercules at this point, or, with still greater probability, of Flora.

POMPEIAN DISCOVERIES.—A number of statues have lately been found amid the ruins of this strangely interesting place; they are of bronze and of marble, and have a high interest in an artistic point of view. Some of the former have enamelled eyes, and all have necklaces, bracelets, and anklets of precious stones. These statues decorated a beautiful temple consecrated to Juno, and which is itself in an excellent state of preservation. A large number of skeletons were found on the pavement of this temple, and it is conjectured that many of the unfortunate Pompeians had, at the commencement of the great eruption, prostrated themselves before the shrine of the goddess, whom they hoped might preserve them from the impending danger. These interesting statues are now being reproduced in terra-cotta. That part of the town which is now being laid open is in a wonderful state of preservation; the pavement of the streets is described as being equal to anything that exists at the present day in Europe. The material used was lava in irregular blocks, but fitted with great nicety, and it appears that when a block became broken or separated from the adjoining one, it was the custom to fill in the interstices and connect the parts by means of iron cramps, instances of such repairs being found in all quarters of the town. This kind of pavement is attributable to the invention of the Carthaginians. The Pompeian streets were provided with side walks, formed in some cases of mere beaten earth, and in others of lava and of small bricks laid in mosaic patterns. These footpaths were raised generally more than a foot from the road, and the pedestrians were protected by posts or by a low parapet. The streets were often so narrow that a man could step across from one sidewalk to the other, but in the wider streets and broad places a curious arrangement existed to prevent the Pompeians from soiling their shoes and clothes, flat-topped posts or stepping stones being placed at intervals in the road, so that a person on foot could step from one side to the other without descending. Such an arrangement, however convenient to the foot passenger, would have been incompatible with a large carriage traffic.

Manufactures.

NORTH LONDON WORKING CLASSES' INDUSTRIAL EXHIBITION.—The formal opening will take place on Monday next, the 17th inst. At 3 o'clock p.m. the Chairman (Earl Russell, K.G.) will be conducted to the platform by the committee and officers. On the chairman being seated, the Psalm C.—“All people that on Earth,” &c., harmonized by Dr. S. S. Wesley, will be sung by the choir. The report will then be read by Mr. W. J. Watts, Hon. Secretary; at the conclusion of which the chairman will inspect the Exhibition, during which time Dr. S. S. Wesley (of Winchester Cathedral) will perform on Willes's grand organ. On the chairman returning to the platform, his Lordship will deliver an address, and declare the Exhibition open. A special ode, composed by W. H. Bellamy, Esq., and set to music by Dr. S. S. Wesley, will be sung by Miss Louisa Pyne, Miss Leffler, Miss Elliot Galer, Mr. Lewis Thomas, and chorus. Prayer will be offered by the Rev. Robert Maguire, M.A., Incumbent of Clerkenwell, during which the committee

earnestly request perfect order and silence. The inaugural ceremony will conclude by the choir and assembly singing the National Anthem, the solo by Miss Louisa Pyne. On the same evening there will be a concert, and a portion of the afternoon music will be repeated. The Exhibition will be open daily from 9 in the morning till 5 in the evening, admittance sixpence; from 7 till 10 in the evening, admittance twopence. On Wednesday, October 19th the children of the Band of Hope Choir will attend and sing during the evening. On Thursday, October 27th, the Tonic Sol-Fa Choir will attend and sing under the direction of Mr. Sarl. The band of the Caledonian School will attend on one evening during the time the Exhibition is open.

THE WORKING-MAN'S INDUSTRIAL EXHIBITION MOVEMENT.—This movement has, it appears, spread to Birmingham, as a meeting was recently held in that town for the purpose of considering the proposal contained in a letter from Mr. Joseph Everard, to hold an industrial exhibition in Birmingham, of a similar character to that now being held in London. After some formal business, a deputation was appointed to wait upon the Mayor to ask for his co-operation, and also to ask for the use of the committee-room of the Town Hall for a public meeting.

IRON MANUFACTURES IN CORSICA.—The iron works of Toga have greatly increased the trade and importance of Bastia, in the immediate vicinity of which town they are situate. The cast iron produced is much esteemed, and is converted into wrought iron of superior quality, steel, &c. Messrs. Petin, Gaudet, and Co., of Rive de Gier (Loire), the proprietors of the works, furnished to the French Government the armour-plates for the frigate *La Gloire*, and other iron-clads. In the recent trials of armour-plates in England, the rolled plates delivered by this firm were very favourably mentioned for the superior quality of the iron, which, no doubt, came from the Toga forge, though the manufacture of the plates was inferior. The Toga works were originally established in 1840, and after undergoing various vicissitudes of fortune, came into the hands of the present proprietors in 1854, since which time their operations have greatly increased in importance, and are yearly becoming more extensive. At present the works possess four blast engines, three of which are constantly at work. The machinery in use is of a total of 330 horse-power, distributed as under:—

Blast engines	180 h. p.
Motive "	100 "
Hydraulic lifts	50 "
	330 ,

Two hundred workmen are employed at the works alone. From 600 to 900 tons of Newcastle coal are consumed annually, but the ore is fused with charcoal, 22,000 tons of which are used per annum. Half of this quantity is imported from Sardinia, the remainder is procured from the forests of Corsica. Thirty vessels are in the continual employ of the company, and 70 more are freighted, as occasion may require, in the year. The average annual quantity of iron ore now used amounts to about 30,000 tons, containing 60 per cent. of ore, and the average quantity of cast iron produced may be reckoned at from 17,000 to 18,000 tons. About 700 tons of hammered iron, of excellent quality, are also produced yearly at the works. The ore is imported from the islands of Elba and Sardinia, and from Spain and Algeria. The firm have lately acquired an iron mine in Sardinia, and will, in future, make use only of the Elban and Sardinian ores.

STEEL MANUFACTURE IN BORDEAUX.—Among the few manufactories of this district there is one which has recently attracted some attention; it is the steel manufacturing establishment, situated on the River Lisle, an affluent of the Dordogne, known under the name of "Les Acieries de Saint Seurin." In it three different systems of treating the metal are employed. Firstly, the cementing process; secondly, the system of Bessemer;

and thirdly, the old process of melting in small pots a mixture of steel and iron in order to obtain different qualities of cast steel. The principal manufacture is that of bar steel, both rolled and hammered, for all purposes. In many industries the use of steel is rapidly superseding that of iron, consequently there is an increasing demand for large blocks of steel worked down to different shapes by the steam-hammer. The manufactured articles are chiefly confined to springs for railroad and other carriages, the quantity turned out being estimated at from 80 to 100 tons a month; and rails, conical bolts and balls, for the French Ordnance Department, are also being manufactured. About 400 hands are employed in this establishment, of which ten are British subjects. The coal consumed up to the present time has been almost exclusively British, amounting to about 12,000 tons annually; but measures are to be taken to employ the French coal from the department of the Aveyron, as the quality has greatly improved of late, and the price is considerably below the English. About 2,000 tons of English pig iron, chiefly from Cumberland, are annually converted into Bessemer steel, and 200 tons of bar iron are imported from Sweden for cementing purposes. But here, again, a change is contemplated, for the intention of the company is to treat French iron in place of British. No English capital is engaged in the concern. That represented by the establishment is £68,000, besides a loan from the French Government of £48,000, which has been laid out in buildings and machinery.

LINEN MANUFACTURE IN IRELAND.—A company has been formed at Cork for introducing the linen manufacture into that city, and they recently held their first meeting. A building is now being erected at Blackpool, a short distance from the city. The chairman said that the company were entirely independent of the flax-growers of the South, and could carry on the business of their mills successfully if there were not a stalk of flax grown in Munster; still, they were most anxious to co-operate with them. It was the opinion of a great many good judges that the flax grown this year in the South is of excellent quality, though it has been in many cases insufficiently watered, and submitted too long to the action of a burning sun. This has greatly lessened the value of the article. They had purchased from a farmer the produce of one acre, which realised £33. The returns for the growth of flax in Ireland for the last two years show an increase for Ulster of 70,000 acres, or three times more than the entire extent of the flax crop in all the east of Ireland. In Ulster in 1863 the crop covered 207,000 acres, this year it is 278,000, while in the other three provinces it is only 23,688. The inference is that the Ulster farmers, being the best judges, would not have extended the cultivation of flax if they did not find it profitable.

Commerce.

FLAX.—The Cork papers give an account of the opening of a flax-market in that city on the 5th October, and it seems to have been a good beginning. The market was held at the southern end of the Corn-market Trustees' premises, and consisted of 19 loads of unscutched, and about 140 stone of mill and hand-scuted flax. The latter came principally from Limerick, the neighbourhood of Mallow, Clonakilty, and Rosscarbery, while the former was brought in from the districts about Cork. Some of it was superior, and showed signs of considerable care and attention having been bestowed on it in the various processes of preparation for market, but other lots were badly prepared, and looked as if they had had but very little steeping. Of competition there was not much, there being only two or three buyers present, but competent judges expressed it as their opinion that in each case the full value of the flax was given. The figures at

which the different loads were sold are as follows:—5 at £8 a ton; 1 at £7 10s.; 1 at £7 5s.; 5 at £7; 6 at £6 10; and 1 at £6.

FOREIGN TRADE AT CANTON.—A comparison of the returns of the past with the preceding year will show a decrease generally in the trade of the port, but by no means to the extent anticipated. To begin with imports, the total value in sterling for the year 1863 is estimated at £2,281,354 against £2,412,515 in 1862, showing a decrease amounting to the sum of £131,161 in the past year's trade. As regards the causes of this decrease, the falling off must be attributed as much to failure in supply as to failure in demand, the rise in piece goods, owing to the American supply of raw cotton ceasing, having brought the foreign into competition with the native manufactures, and as the Chinese prefer the latter, from being heavier and of more lasting quality, they abandon the former the moment its price places it beyond the denomination of being a cheap article for clothing. Comparing, for instance, the imports of cotton manufactured goods for the two preceding years:—

	1862.	1863.
American drills..... pieces	30,965	2,196
Shirtings, grey	126,529	48,829
Ditto white	49,788	44,695
T cloths, 36 yards	4,570	6,055
Ditto 24	20,601	28,802
Cottons dyed—		
Figured, plain	21,627	20,100
Damasks	3,667	3,006
Printed	11,382	15,812
Muslins	510	1,984
Handkerchiefs	dozens 28,057	27,121
Velveteens..... pieces	1,711	4,813
Cotton velvets	1,060	2,625
Yarn	piculs 20,834	14,819
Cotton, Bombay raw.....	35,928	488

A large deficiency in plain goods appears, and particularly in the article of Bombay raw cotton, whilst in fancy goods the difference is rather in favour of 1863. This latter may be accounted for by the heavy stocks on the manufacturers' hands, which rendered their going off beneficial to the holders, and therefore the prices were not affected in a ratio proportionate to that of the plain manufactures. But if the imports of woollen manufactures be taken—

	1862.	1863.
Blankets	pairs 3,510	3,849
Broad cloths	pieces 157	148
Camlets, English	3,993	4,831
Do. Dutch	610	697
Do. imitation	644	1,761
Habit and medium cloths	566	1,496
Flannels	271	352
Lastings	3,441	4,641
Long ells	8,660	11,863
Sp. stripes	9,007	7,448
Woollen and cotton mixtures	8,769	5,769

It will be seen that the balance is generally in favour of 1863, and this arises from the fact that wool has not been subjected to the fluctuations of raw cotton, or deficiency in supply, and therefore, if anything, there has been an improvement, and not a deficiency, in this branch of the import trade. The result of these comparisons tends to show that the decrease in the value of the import trade of 1863, namely, £131,161, is owing as much to foreign as to native influences; and that, under such circumstances, the past two or three years will afford no criterion of the capabilities of Canton as a mart for foreign manufactures. The import of opium in 1863, as compared with 1862, differs in amount but little. The temptation to smuggle so valuable an article, and the facilities the coast affords for that purpose are so great, that in all probability what passes through the Canton Custom-house is for local consumption only, and so it will be until the Chinese authori-

ties establish a preventive service. The value of the export trade may be taken at £3,862,039, against £4,060,746 in 1862, showing a decrease of £198,707. This may chiefly be attributed to the short supplies of tea, the export in 1863 being less than in 1862 by at least 7,418,890 lbs.; but, less though it be, it is more than was anticipated, the opinion being at the close of last season that little or no tea would come again to Canton. But notwithstanding this, not only did it come down, but the tea-men held out for high rates, and generally obtained them. As regards silk, the export of the two years, 1862-63, is much on a par.

COTTON IN TEXAS.—According to late accounts from Texas it appears to be expected that the growing cotton crop of that State will be as large this year as ever it was, owing to the amount of negro labour that has been transferred thither from Louisiana, Mississippi, and Alabama, the region of the war movements. Picking is now in progress, and the probable yield is represented to be more than 450,000 bales. It is asserted that all the other States in the Southern Confederacy combined will not make an equal amount this year. Texas has suffered, and still suffers, from the war, but her losses are nothing compared to those of other Southern States, or as measured by her own abilities. There is said to be a great leak on the frontier of Texas, through which large quantities of cotton are finding their way into Mexico, and thence to Europe. It is asserted that persons in Texas hold nearly 500,000 bales of last year's crop of cotton, which, added to the supplies within the lines of Arkansas and the parishes of Louisiana bordering on the Red River, would give a total probably of at least a million of bales.

METRICAL SYSTEM IN BUENOS AIRES.—The government of this province has just determined that the use of the decimal metrical system be rendered obligatory in the province of Buenos Ayres from the 1st January, 1865. It is probable that this example will be promptly followed by the other provinces of the republic.

COMMERCE OF THE FIJI ISLANDS.—Two Australian companies, composed of merchants of wealth and position, have invested capital largely, and formed extensive and important establishments in these islands; one company alone having erected machinery for preparing oil from the cocoanut at an expense of over £7,000. In these works the nut is ground, sweated, pressed, and caked by steam machinery of the most improved description. The quantity shipped in the half year ending June, 1863, was 450 tons, valued at £22 per ton. Other and newer resources of the country, such as cotton and coffee, have also worked into encouraging existence. Among the exports in the half year have been 320 piculs (133 lbs. each) of beche de mer, or tripang, valued at 48s. the picul; 1,700 lbs. of tortoise shell at 10d.; and 1,250 lbs. of mother of pearl shell at 4d. the pound. A few enterprising men have devoted their attention to the growth of coffee; 12,000 trees are under cultivation, half of which are expected to bear fruit this year. Experience has shown that the climate and soil are admirably adapted for the successful production of cotton, and a considerable number, in proportion to the white population, have got little plantations; 7½ tons have already been shipped. Half a ton of tobacco had been exported to Sydney; the plant grows luxuriantly in the islands. Sugar, arrowroot, and other products are used for island consumption. There are now about 3,000 sheep in the islands landed from Sydney. This importation has been a decided success, and generally they are doing well. As the sheep are being introduced by men of capital, it is not improbable this interest will largely increase in a few years. There are as yet but a very limited number of horses and cattle, but of swine there are 5,000 head.

FRENCH COAST FISHERIES.—Notwithstanding the disadvantages at which the fishermen on that part of the coast are placed in comparison with parts nearer to Paris, such as Dieppe, the carriage of fish from which place is

one-third less than from Calais, Boulogne, and Dunkirk, forty additional boats were built and launched at Calais during the seasons of 1862 and 1863. The number of boats engaged in the fishing trade at Calais and the adjacent villages, is 135, employing 682 men. The herring fishery must be regarded almost as a monopoly for Boulogne; the value of the take of herrings by the Calais fishermen during the last season having been only £1,801, whereas at Boulogne it amounted to £93,110. The port of Gravelines, following the example of Dunkirk, has increased its trade in the Iceland fishery.

WOON IMPORTS.—The total imports of sheep's wool last month were 56,457 bales, and of goats' wool 2,715 bales. Of the sheep's wool 10,811 bales were Australian, 6,540 South African, and 12,187 East Indian. A good deal of the Indian, North African, and Turkish wools are now received at Liverpool.

ORCHELLA WEED.—The consumption of this dye lichen in France and Germany would appear to be on the increase. About 17,000 cwt., shipped in each of the last two years from the republic of Ecuador, appears to have gone to the Continent.

Colonies.

PROGRESS OF VICTORIA.—In 1851, when Victoria for the first time obtained a legislature, there were but eighty-one manufactories in the colony, although the first settlers landed on the banks of the Yarra in 1835, although the first newspaper of the colony was published in 1838, and the bounds of the city of Melbourne were set out in 1843. Ten years after the first regulations for the sale of land in Port Phillip were issued, in fact, the whole of the fellmongeries, mills, boat-building establishments, &c., every workshop, in short, to which the name of manufactory could be given, did not exceed the small number already stated. Last year the aggregate number was 708, and when the examination is carried back it is found that the rate of progress has increased rapidly of late years. The reason why is easily given. The growth of wool and the scraping of gold from the earth no longer engrossed the attention of the producing classes. It cannot be said that legislation has done much to bring about the change. This colony is still without the oil from the olives, of which there was some expectation two or three years ago, and the cultivation of raisins and currants, rice and hops is still behindhand. The increase of manufactories is due to the efforts of the colony to become its own supplier of articles of import requiring greater capital and skill in their manufacture than those simpler products which have been favoured by the legislature as special industries. The preservation of beef for export is not a new industry in this colony, but it is now packed in casks of colonial wood and colonial make. Cattle and sheep are not only sent to New Zealand, but Melbourne assumes to Dunedin the position which Aberdeen maintains to Smithfield, as its purveyor of fresh as well as cured meat. Steamship building is also another industry not new, but the combination of iron and wood in the product of the shipyard is new, and the first vessel built in the colony on this principle was launched not long since. There is steam machinery at work supplying cordage of all kinds, from the smallest to the largest sizes. A steam collier, the first ever engaged in the trade, now plies between Melbourne and Newcastle, and a second of very much larger dimensions is about to make her trial trip. The colony, no longer dependent on Boston, now manufactures the ice which is regarded as indispensable in summer. Chemistry has also been applied to other arts, and by its aid are produced on the banks of the Yarra a variety of products indispensable in a manufacturing community. Boots are made partly, at least, by machinery, and altogether of colonial material. From portable caps and specifics for disease in sheep (and the last forms no incon-

siderable item in the table of exports), Victoria has advanced to cigars, which are said to rival those of Havannah and Manilla. No longer finding it necessary to resort to the London markets for the finest description of binding and book-work, this colony will soon also be independent of Europe as regards printing paper, the machinery for the first paper mill being now in course of importation.

AUSTRALIAN SUGAR.—A Queensland Cotton Company have recently exhibited a splendid sample of sugar-cane grown on their plantation. The cane was pronounced by competent judges as equal to the growth of any part of the world, and it has arrived at maturity in something less than ten months. In Queensland, the prospect of sugar cultivation on a profitable scale is said to be becoming every day more manifest.

REVENUE OF QUEENSLAND.—The following is a statement of the consolidated revenue of the colony of Queensland, and of the special funds paid into the Treasury at Brisbane, during the quarter ending 30th June, 1864, compared with the corresponding period of 1863:—

	1864.	1863.
Customs	£38,650 10 8	£31,066 18 11
Land Revenue	14,986 11 2	16,907 12 8
Postage	3,465 11 9	2,670 19 1
Licences	7,754 14 8	4,843 7 3
Fees of Office	2,178 11 6	1,453 1 1
Fines and Forfeitures ...	251 17 11	313 13 9
Rents (exclusive of land) ...	97 16 8	72 18 9
Pilotage, Harbour Dues, and Fees	491 12 6	507 7 4
Civil Service Supply Fund	335 3 3
Electric Telegraph Receipts ...	1,368 11 5	1,151 9 0
Miscellaneous Receipts ...	2,681 10 8	708 7 5
Special Receipts ...	6,003 16 3	3,063 10 5
	<hr/>	<hr/>
	£78,266 8 5	£62,759 5 8

Showing an increase in the total of £15,507 1s. 9d.

ELECTRIC TELEGRAPH IN QUEENSLAND.—The establishment of telegraphic communication between Brisbane and Moreton Bay has been most successfully accomplished. The work was commenced on the 28th of June. The most favourable place for starting the connection between Stradbroke and Moreton Island having been decided upon, it was found that, in order to avoid the flats and sand-banks, about 1,800 yards more cable would be required here than was expected; and altogether about four miles of cable were yet to be laid. It is not intended to use any portion of the cable which remains after laying the necessary quantity between Cleveland and Dunwich, as it is not thought desirable that any splicing of the cable should take place. The landing of the necessary apparatus was found very difficult and laborious, owing to the nature of the wide beach that extends from Dunwich into the sea. It was, however, successfully accomplished. The land line from Lytton to Cleveland, and from the north to the south side of Stradbroke Island, is being rapidly completed, and it is expected that, simultaneously with the arrival and laying of the remaining portion of the cable, it will be ready for the transmission of messages.

RAILWAYS IN QUEENSLAND.—The works on the railways are progressing favourably. A branch line is being made from the new storehouse at North Ipswich to the recently constructed railway wharf on the north bank of the Bremer, on which the whole of the rails, rolling stock, stores, and plant, will be landed. The first section of the railway from Ipswich to Bigges Camp (21 miles) is to be ready for public traffic by the 1st June, 1865, but by Christmas next locomotive engines will be running upon the line, employed in carrying rails, ballast, contractors' materials, &c. So soon as the Loan Bill is passed, the Government will proceed with the construction of the extension of the railway to Dalby, which it is hoped will be completed by the 1st January, 1868, or under three and a half years from the present time. The surveys of the line from the Toowoomba to Warwick are nearly completed. Although the country through which this line will run is very broken, and will be troublesome to the engineers, the gradients and curves will, generally, be unobjectionable.

THE REVENUE OF NATAL, for 1863, was estimated at £99,928, and it realised £118,343. The excess arises from a general increase of the various items of revenue, Customs' duties £5,000, and transfers £3,000, being the chief items. The revenue for 1865 has been estimated at £137,145, being an increase over that estimated for this year of £32,000, and £23,000 over the actual receipts of 1863. This large increase is based upon the actual receipts of 1863, together with the progressive increase of former years, the reports of the collectors of revenue, and the receipts of this year. The expenditure, as usual, has been made to tally nearly with the revenue.

NEW SOUTH WALES REVENUE.—A comparative statement of the Consolidated Revenue of New South Wales, and of the special funds paid into the Treasury at Sydney, during the quarters ended 30th June, 1863, and 30th June, 1864, respectively, shews that the total revenue proper for the quarter ended 30th June amounted to £337,511 15s. 6d.; for the corresponding quarter of 1863 the receipts reached £450,978 6s. 2d. There is, therefore, a decrease in the quarter of £113,466 10s. 8d., or 25 per cent. The heads of revenue which show a decrease are the Customs duty on spirits distilled in the colony, gold, land revenue, licenses, fines and forfeitures, and miscellaneous receipts. Those which show an increase are Mint receipts, postage, commission on money orders, railways, electric telegraph receipts, pilotage rates, and tonnage dues. The decrease in the quarter's revenue is chiefly owing to the falling-off in the Customs; the decrease as compared with the corresponding quarter of 1863 being £93,859, or nearly 42 per cent., and on duty on spirits distilled in the colony there is a decrease of £21,315, or 88 per cent. The gold revenue shows a decrease of £2,303, but on the Mint receipts there is an increase of £2,810, in consequence of large quantities of gold having been sent there from Victoria and New Zealand for coinage. The land revenue shows a decrease of £4,441; the receipts for the quarter ended 30th of June, 1864, being £42,516, against £46,956 for 1863. The postage receipts exhibit an increase of £2,511, and the commission on money orders an increase of £227. Under the head of licenses there is a decrease of £1,631, but from fees of office there is a small increase of £31, and from fines and forfeitures a decrease of £593. The amount of rents exclusive of land exceeds the corresponding quarter of 1863 by £585. The receipts from railways show a satisfactory increase of £3,455, or 13 per cent., but from the electric telegraph receipts there is only the paltry increase of £15. From pilotage rates and harbour dues there is an increase on the quarter of £1,544, and from tonnage dues, Newcastle, an increase of £539. The rates under the Chinese Act amount, for the second quarter of 1864, to £70, against £60 for 1863. Under the head of miscellaneous receipts there is a decrease of £700. In this return is a new entry, viz., the proceeds of sale of Treasury bills applied in payment of service of 1863 and previous years, under Act 27 Vic. No. 8, £204,907 19s. 11d., and this sum is carried out by itself as a decrease. Under the head of special receipts, there is an increase of £20,481 3s.; the receipts for the quarter ended the 30th of June, 1864, being £35,105 15s. 11d. against £14,674 12s. 11d. for 1863. For the first quarter of the year 1864 the total revenue proper was £290,305, and this, together with £337,511, the receipts for the quarter ended the 30th June, will make the revenue for the half-year amount to £627,816. For the same period of 1863, the revenue reached £788,016. The decrease in the half-year is, therefore, £160,200, or 20½ per cent.

THE ALPACAS IN AUSTRALIA.—A Sydney paper states that Parliament having determined last session that the flock of alpacas, brought six years since from South America by Mr. Ledger, should be disposed of, arrangements were made for the sale of the animals at Wincello, the property of Mr. Edward Payten, who for the last twelve months has had charge of the flock. Sir John Young, who was accompanied by the Premier and

the Minister for Lands, attended the sale, at which there were about 150 persons present. The flock, which numbered 307, was divided into lots of from four to eleven animals, the majority of the lots consisting of four females, one pure alpaca, and one wether. The whole of the animals were in very good condition. The auctioneer, before commencing the sale, referred to the circumstances attending Mr. Ledger's enterprise, and also to the fact that the experiment made to introduce alpacas into Victoria had proved a failure, the whole of the animals having died. The sale was then proceeded with, but there did not appear to be a disposition on the part of the buyers to give the price that was expected by the Government, who were not prepared to let the animals go at a sacrifice. After unsuccessfully offering several lots, only three of which found purchasers, the auctioneer was instructed to close the sale. Subsequently, however, some other lots have been sold, comprising altogether forty-seven animals, for which the Government have received £1,068 15s. Although the sale was unsuccessful, the amount realised will be considerably more than the cost of the management of the flock for another year, and in the meantime there will be an increase far exceeding the number of alpacas disposed of, as no less than 107 of the females are reported to be with young. The Government have, therefore, sustained no loss by the sale. Amongst the purchasers were the Superintendent of Auckland, the Acclimatisation Society of Victoria, the Acclimatisation Society of New South Wales, and that of Auckland.

THE IMPORTS OF NATAL in 1863 were £473,333, being an increase of £23,000 over 1862, and the exports for 1863 were £154,000, or 21 per cent. over 1862. The increase in the export of ivory was about 80 per cent., on wool 30 per cent., and on sugar 50 per cent., these being the three great staples. The amount of sugar consumed in the colony is also very considerable. In the items of cotton blankets and sheets, in 1863, a falling off has taken place, which may be accounted for partly by many being made into coats, and also by the idea prevailing that the Customs dues on these articles were likely to be reduced. On beads there was in 1863 an increase of 9,000 lbs. weight over 1862. Under the item of picks there is a falling off of about 2,000 picks, which was more than probably made up for by the number of hoes, which are highly taxed. The increase in the importation of spirits for the year 1863 was 15,000 gallons; nearly a gallon a piece for every man, woman, and child. In woollen blankets there was an increase of 4,591 pairs, value £1,800, notwithstanding the high tariff and its evasion by blanket coats.

Publications Issued.

THE PAST AND FUTURE OF ARCHITECTURE (*Le Passé et l'Avenir de l'Architecture*), by the Duc de Valmy. 8vo. (Michel Lévy, Frères, Paris).—The Duc de Valmy is well known as an architectural connoisseur, and generally as an amateur of the Grecian style, but in the present work he has taken up the subject from a broader basis, and he has thus contributed to the art literature of the day with M. Viollet-le-Duc, M. Cesar Daly, and other writers, intent on, if possible, reforming public as well as artistic opinion with respect to the very important questions of art education and scholastic dogma.

AN ESSAY ON THE PRINCIPLES OF PAINTING, by Jean Restout, painter in ordinary to Louis XV., 8vo., Caen.—M. de Formigny de la Londe has discovered and published this little work by a painter who enjoyed considerable reputation a century ago. The history of Jean Restout has been made known to the world by M. de Formigny and the *Société des Beaux Arts* of Caen. There were two Jean Restouts, the elder being the nephew and pupil of Jouvenet; the younger became a member of the Royal

Academy of Paris in 1717, and forty-four of his works are catalogued by his editor. Of these, the gallery at St. Cloud possesses a picture of "Arethoven flying from the pursuit of Alpheus;" and in the Louvre are a "Consecration of Saint Paul," and "Christ healing the Cripple;" other examples are to be seen in the museums of Rouen, Tours, Caen, and in the Hotel de Ville of Alençon. The work of Jean Restout indicates a man of broad and critical mind, who looked upon painting as a serious art, and demanded of the painter an amount of study for which, unfortunately, few have at once the time and the inclination. He says a good painter should have a fair acquaintance with geometry, perspective, anatomy, mechanics, geography, and music; with physics, in order not to offend against the effect of nature; with the characters and passions of men; with sacred as well as profane history; and should know the poets, the habits and customs of all the ancient people, their fêtes, games, sacrifices, and funerals; their architecture, furniture, arms, dresses, and equipages. The remarks of the writer on the fundamental necessity of good drawing are trenchant and pointed:—"Before attempting composition," he says, "the young artist must know how to draw well; for the former includes the idea, the colouring, the chiaroscuro, and the sentiment of the picture. . . . Artists generally paint as they draw." This is a sharp hit at slovenly painters, who fancy they can paint out or over their original faults, but one can hardly say it is too severe. It is evident that Jean Restout was a sharp disciplinarian, and, considering the condition of art at the time in which he lived, this proves him to have been a man of a decidedly original and self-relying turn of mind.

Notes.

ARCHÆOLOGICAL DISCOVERIES.—Two interesting monuments have been discovered near Alatri, in the Campagna Romana. This town, of Pelasgic origin, and celebrated for its Cyclopean walls, is situated on the top of a mountain, and being at the time of the Romans ill provided with water, the Censor L. Betilienus Varus, as a celebrated inscription tells us, caused an aqueduct, 340 feet high, to be constructed between Alatri and the neighbouring mountains; it being expressly stated that he built it with arches, and provided it with strong pipes. The present researches ordered by Pope Pius IX., in order to renew the supply of water to the town, have led to the discovery of a large portion of the old aqueduct. From the survey made by Father Secchi, it appears that the lowest point of the aqueduct lies 110 metres below the highest point of the town, a figure which coincides with the 340 feet of the inscription. Here, therefore, there is an aqueduct built 160 years before Christ, in the shape of a reversed siphon under a pressure of eleven atmospheres. It is difficult to say how much water was conveyed by this aqueduct, but it was evidently sufficient for the consumption of the town, since the piers of the arches measure no less than five feet nine inches in breadth. The total length of the siphon is about six kilometers. The other discovery is a field under which a complete system of drainage was executed by means of long pipes made of brick clay, and on an average a foot and a half in diameter. They are now stopped up with sediment, and are $\frac{2}{3}$ metres below the surface of the soil. This field was probably the parade ground mentioned in the inscription as having been laid out by Betilienus, whose attention to the interests of his city was well rewarded, since he was twice appointed censor, and a statue was erected to his honour.

CANADIAN FISH.—A correspondent of the *Athenaeum* desires to draw the attention of the Acclimatisation Society to the celebrated "white fish" of the Canadian lakes, especially of Lake Michigan and the Manitou Islands, the acknowledged excellence of which fish, with its northern habitat, would seem to point it out as a most

valuable addition to our northern lakes of Cumberland and Scotland, now almost valueless; whilst the difficulty of transporting the ova from the Canadian lakes to England would be much less than that experienced in the case of bringing the Silurus from the Argisch to our shores.

OYSTER CONSUMPTION IN PARIS.—Notwithstanding the high price at which they are sold (generally from 8d. to 10d. a dozen), it has been calculated that 7,000 to 8,000 baskets are daily emptied in Paris. Every basket contains 150 oysters, so that 1,200,000 are daily consumed there.

FISHING BY ELECTRIC LIGHT.—The use of electricity, as a submarine light, is developing rapidly. In the last number of the *Journal* the application of the light to nautical purposes and in submarine works was referred to; its use in sea fishing is also of interest. It is well known that fish, like moths, are attracted by light, and to be fascinated by it. Fishing by torch or other light has been long practised on the French as well as other coasts. The boats carry a skillet at their prow, and a blazing fire is kept by means of fir cones and resinous woods, but this is only one of the many modes in use. In 1857, Mons. J. Atongua de França-Netto, an engineer of Dunkirk, made experiments in the Gulf of Finland, setting himself the following problem:—To obtain a light that should illuminate the water to the depth of 50 to 200 yards, and which should not be disturbed, like the boat beacons, by the movement of the waves. He made use of a submarine electric light, and in one case four men took a thousand pounds weight of the finest fish in forty minutes, or as much as twenty or thirty would have obtained in the ordinary manner. Having proved that a submarine light affected the fish in the same manner as one above the waves, the next thing was to obtain a lamp that would support the pressure, and the director of the famous glass-works of Baccara has produced for the purpose crystal globes nearly twenty inches in diameter, a centimetre, or two-fifths of an inch, in thickness, and weighing upwards of fifty pounds. Subsequent experiments, some of which were made by order of the French Government, have clearly proved that all kinds of fish are attracted by the light, and that when they have approached within a certain distance they seem powerless to quit the spot, and hover about the spot till captured or driven away. Mons. De França-Netto has invented a new kind of net, or trap, to use with the light, and both have been tried on the coast of England as well as of France. Means are being taken to apply the system on an extensive scale.

WASTE OF SILVER IN PHOTOGRAPHY.—MM. Davanne and Girard have addressed a series of papers to the Academy of Sciences on the subject of photography, making some curious revelations with regard to the waste of precious metals in the operation. For instance, the silver alone which is employed for photographs in Paris amounts to several millions of francs. Now, as only 3 per cent. of the silver employed remains on the photograph, 97 per cent. will continue to be lost unless some method be found for recovering it. MM. Davanne and Girard, who make this startling announcement, propose that plates of copper be put into the argentiferous liquid, whereby in the course of three or four days the silver will be precipitated in a spongy state.

Correspondence.

NORTH LONDON WORKING CLASSES' INDUSTRIAL EXHIBITION.—SIR,—In our *Journal* of September 2nd you inserted a letter of mine on the above subject, in which I gave a sketch of the rise and progress, so far, of the movement. That which was then in a comparatively incipient condition, is now an accomplished fact, and the Exhibition will be opened on Monday next, the 17th inst., at 3 p.m., by Earl Russell.* I expressed in my

* See page 752.

letter a pretty confident expectation that the invitation to exhibit would be extensively responded to, but I had no idea that the applications for space would so far exceed the limited amount then at the disposal of the committee, that, instead of contenting themselves with the modest dimensions of the minor Agricultural Hall, they would be compelled to take the larger one. This has, however, proved to be the gratifying result, and the public will be both surprised and pleased to find in that great building articles of British local industry suitably arranged, far exceeding in interest anything of the kind that has hitherto been exhibited in the metropolis. In my former letter I said that "the workmen had gone about their great project in a workmanlike way," and this will be found to be eminently the case. The guarantee fund has, without solicitation on their part, arrived, I believe, at a total beyond £400, and ranks among the subscribers to it such well-known and respected names as Lord Shaftesbury, the Chancellor of the Exchequer, Miss Burdett Coutts, Assistant-Judge Bodkin, Alderman Lusk, Messrs. J. A. Nicholay, Harry Chester, Samuel Morley, and many others equally eminent, besides a very large number of their own body. The financial committee, however, have not been tempted by this handsome resource in case of need, to incur any unnecessary pecuniary obligations. The central committee (a numerous body) have given their valuable services gratuitously, and the directors of the Agricultural Hall Company have placed the great hall at their disposal on very liberal terms. Much vocal and instrumental talent has also been freely offered and accepted for the opening ceremonial, and Earl Russell will, on that occasion, be well supported. It is intended to distribute prizes (none pecuniary) and testimonials, but the precise nature and value of the former must depend on the surplus means placed at the disposal of the committee, when the Exhibition is finally closed. I hope, however, that under any circumstances, some of the more wealthy well-wishers to movements in this direction will be disposed to assist this fund by special contributions. The gentlemen who, at the request of the central committee, have undertaken the delicate and important duties of adjudication, will only be too happy to find that their desire to give extensive encouragement to skilled and other workmen, is not circumscribed by limited financial resources.—I am, &c., THOMAS WINKWORTH.

Canonbury, October 11, 1864.

Patents:

From Commissioners of Patents Journal, October 7th.

GRANTS OF PROVISIONAL PROTECTION.

Aerial navigation—2299—M. A. F. Mennons.
Air, &c., steam engines for blowing, &c.—2192—J. T. Crosland.
Artificial fuel—2276—J. H. Johnson.
Atmospheric pressure, &c., apparatus for propelling by—2210—Sir J. S. Lillicoe.
Boots and shoes, manufacture of—2246—G. Haseltine.
Bottles, stoppers for—2335—N. Thompson.
Boxes, cases, &c., construction of card board, &c.—2268—W. Austin.
Boxes, safety match and fusee—2289—A. Figge.
Bricks, &c., kilns for drying, burning, &c.—2270—T. R. Crampton.
Brushes—2292—J. Vero.
Cables, manufacturing telegraphic—2341—A. V. Newton.
Candles, manufacture of—2339—W. Palmer, jun.
Cements, &c., fire resisting—2320—E. Young.
Chromic acid and chromates, manufacture of—1362—F. O. Ward.
Cigars, manufacture of—2319—J. H. Johnson.
Door locks—2367—A. J. Adams.
Doors, win dows, &c., alarm applicable to—2284—W. Lea.
Engraving, process of—2190—P. E. Plaet.
Eye protectors, manufacture of—2337—H. Vale.
Fabrics, mbroidering woven or spun—2301—A. Higgins.
Fibrous materials, spinning and winding—2288—J. Smith.
Fibrous substances, bleaching—2230—H. Potter.
Fire-arms, breach-loading—2308—R. A. Brooman.
Fire-arms, construction of—2383—J. Jongen.
Flour mills—2212—L. F. Goodbody.
Guns, gun carriages, and projectiles—2226—G. Clark.
India-rubber, driving straps and tubes of vulcanised—2256—M. L. J. Lavater.
Iron and steel, manufacture of—2278—F. Yates.

Lamps, burners for—2327—I. Watts, jun.
Lightning conductors—2254—A. Berisch.
Lubricating, apparatus for—2314—J. L. Courcier.
Lubricators—2266—S. Bennett.
Malleable iron, manufacture of slabs or blocks of—2304—W. P. Struve.
Metal, apparatus for cutting or shearing—2323—S. Laing.
Metal, rolling, bending, and circling plates of—2343—J. Todd.
Mines, lubricating the axles of carriages for conveying coals from—2258—J. G. Hey.
Motion, continuous rotary—2272—L. Colombe.
Nails, spikes, &c., manufacture of—2351—W. Whittle.
Newspapers, &c., contrivance for cutting open—2274—C. Brown.
Phosphore of iron, &c., manufacture of—2294—R. A. Brooman.
Photographers, envelope frames for the use of—2300—J. B. Schott.
Photographs, cases or receptacles for—2373—K. H. Lane.
Pipes and cigars, obtaining light for—2286—D. Tamet.
Pitch and spirituous oils, separation of, from matters—2359—L. Alexander and W. B. Nation.
Porcelain, glass, &c., ornamentation on—1981—W. Clark.
Railway signal apparatus—2312—F. Hovenden.
Railways, permanent way of—2305—W. Clark.
Railways, propelling trains on—2257—T. Moy.
Railway trains, communication between passengers and guard—2250—W. Chubb and S. Fry.
Railway turn-tables—2275—M. D. Jeffreys.
Ribbons, &c., weaving—2286—R. Flude.
Screens and sieves—2363—J. Hill.
Sewage matters, utilisation of—2329—T. and T. F. Walker.
Sewing machinery—2196—A. V. Newton.
Ships, &c., protecting the sides and bottoms of—2387—T. J. Denne.
Steam boilers, preventing incrustation in—2252—A. V. Newton.
Steam engines, &c., fabricator for the cylinders and valves of—2248—R. Townsend.
Telegraphs, batteries and electric printing—1720—R. A. Brooman.
Telegraphs, printing by electricity for—2260—J. H. Simpson.
Threads of yarns, manufacture of—2306—W. Wilkinson.
Ventilators, construction of hoods for—2264—R. Holt.
Vessels, casks, &c., fermenting, charging, &c.—2222—J. Williams.
Volatile minerals, &c., distillation of—2282—J. H. Burns.
Warming apparatus, portable—2353—R. Hattersley.
Wet gas meters—2310—E. Smith.
Wood, machinery for cutting—2198—H. Grafton.
Worts, &c., mashing and cooling—2298—W. Laurence.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Cotton bales, labels or tags for—2397—G. Haseltine.
Harvesting machines—2442—G. T. Bousfield.
Ores, &c., breaking and grinding—2396—G. Haseltine.
Petroleum, &c., adapting casks to retain—2430—W. S. Cowles.

PATENTS SEALED.

877. J. Picking.	941. H. Higgins.
878. D. Moseley.	942. S. Moore.
881. N. Wood and J. Stockley.	943. G. A. Tremeschini.
882. E. Pratt.	946. A. H. A. Durant and W. H. P. Gore.
886. R. Thatcher.	947. T. L. Scowen.
892. J. Howell.	968. A. W. Smith.
893. J. H. Simpson.	977. G. Burstall.
895. J. Nisbet.	992. A. V. Newton.
904. W. E. Gedde.	997. W. Clark.
905. T. C. Jones.	998. J. Abraham.
910. F. A. P. Pigou.	1005. J. G. Jennings.
912. T. Chamberlayne.	1006. J. G. Rollins.
914. J. Lillie.	1007. J. G. Jennings and M. L. J. Lavater.
915. M. L. Peters & W. Harkes.	1008. A. Leighton.
918. A. J. Fraser and F. Squire.	1014. J. C. Rivett.
919. W. Gadd, jun.	1015. W. Clark.
926. A. Audiger.	1032. J. Smyth.
928. J. C. Evans and J. C. Thompson.	1062. E. J. W. Parnacott.
931. J. Neilson and J. Gillies.	1129. A. V. Newton.
932. T. W. Miller.	1606. W. Perks, jun.
934. J. Cope.	1662. J. W. Jones.
935. P. A. le Comte de Fon-taine-moreau.	1774. G. Davies.
936. J. Bullough.	1785. A. Wyley.
937. T. Steven and C. Batty.	2028. A. B. Childs.
939. F. Browett.	

From Commissioners of Patents Journal, October 11th.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2456. J. Tweedale.	2508. H. Willis.
2496. T. Hughes.	2533. L. Christoph, W. Hawks- worth, and G. P. Hard- ing.
2499. A. Chaplin.	
2524. J. J. Russell.	2535. J. Downs.
2511. S. Bremner.	2555. A. V. Newton.
2507. W. Catford and J. S. Wheatley.	2531. C. W. Felt.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2541. W. E. Newton.	2556. J. T. Pitman.
2552. J. Combe.	2574. T. Grubb.
2566. J. Warburton.	